Fact Sheets

SRS

F/H Area Seepage Basins Groundwater

Background

The F and H Area Seepage Basins Groundwater Operable Units consist of the groundwater impacted by operations of the F and H Area Hazardous Waste Management Facilities (HWMFs). The F and H Area HWMFs are located in the center of the Savannah River Site (SRS), approximately five miles and six miles, respectively, from the nearest plant boundary.

The F Area HWMF consists of three unlined, earthen surface impoundments, referred to as seepage basins. The F Area seepage basins cover approximately 6.5 acres. They received approximately 1.8 billion gallons (7.1 billion liters) of low-level waste solutions originating from the processing of uranium slugs and irradiated fuel in the F Area Separations Facility from 1950 through 1988. The effluents were acidic (wastewater with nitric acid) and low-activity waste solutions containing a wide variety of radionuclides and dissolved metals.

The H Area HWMF consists of four unlined, earthen seepage basins that cover approximately 15.5 acres. They received approximately 1.6 billion gallons (6.0 billion liters) of similar waste solutions (wastewater with nitric acid) resulting from processing at the H Area Separations Facility during the same time period. In addition to the waste effluents from the H Area chemical separations processes, the H Area basins received effluent from tritium facilities and from the Receiving Basin for Offsite Fuel.

Waste solutions were transported approximately 3,000 feet from each processing area through underground vitrified clay pipes to the basins. After entering the basin, the wastewater was allowed to evaporate and to seep into the underlying soil. The purpose of the basins was to take advantage of the interaction with the basin soils to minimize the migration of contaminants to exposure points. Though the seepage basins essentially functioned as designed, the acidic nature of the basin influent caused mobilization of metals and radionuclides resulting in groundwater contaminant plumes. More than 99 percent of the radioactive releases to the basins are attributable to tritium.

Environmental Concerns

A groundwater monitoring well network was installed in the 1950s. Currently, more than 235 monitoring wells are sampled for a variety of chemical and radioactive parameters. Groundwater monitoring results have indicated the presence of elevated levels of metals, radionuclides and nitrates. Also, the presence of tritium in groundwater presents a unique clean-up challenge because there is no large-scale technology that removes or separates tritium from groundwater.

Significant chemical differences exist between the groundwater from the two areas. The F Area groundwater contains higher concentrations of dissolved metals (e.g., aluminum) than that in H Area. The constituents of concern (COCs) associated with the F Area HWMF groundwater plume are tritium, uranium-238, iodine-129, strontium-90, curium-244, americium-241, technetium-99, cadmium, and aluminum. The COCs in H Area are tritium, strontium-90, and mercury.

In 1986, the determination was made that the basins should be regulated under the Resource Conservation and Recovery Act (RCRA) as hazardous waste disposal facilities, and closure plans were initiated. The basins were closed by dewatering, physically and chemically stabilizing the remaining sludge, and by covering them with a protective multi-layer system to reduce rainwater infiltration. The basin closures were completed in 1991.

Environmental Actions and Plans

In 1992, SRS was issued a RCRA Part B Permit that specified ongoing groundwater monitoring requirements and a Corrective Action Plan to remediate the contaminated portions of the uppermost aquifer. Several of the contaminants exceeded regulatory limits and were targeted for remediation.

In 1996, the Industrial Wastewater Treatment (IWT) Permit for the HWMFs was approved. The IWT Permit prescribed the installation of a network of injection and extraction wells and the mechanical and chemical systems needed to augment the wells.

In 1997, SRS designed and built two water treatment units (WTUs). The systems were designed to treat metals, radionuclides, and to reduce the migration of tritium to Fourmile Branch by trapping it in an extraction/re-injection loop until it decayed to regulatory limits. The current remediation system extracts groundwater down gradient of the seepage basins, passes it through a WTU to remove metals and radionuclides, and re-injects water upgradient to maintain the recirculation loop.

In F Area, the extracted groundwater is processed through a series of filtration, reverse osmosis, precipitation, flocculation, and ion exchange processes prior to re-injection. The flocculation step is necessary due to high concentrations of dissolved aluminum in the extracted groundwater. In H Area, the extracted groundwater is processed through an ion exchange system prior to re-injection. Injection water quality compliance limits for both areas are established under an Underground Injection Control (UIC) permit with the South Carolina Department of Health and Environmental Control (SCDHEC).

Additional investigations performed in F Area revealed the presence of acidic secondary contamination in the subsurface with metals and tritium contributing to the conditions at the seepline of Fourmile Branch. These conditions were key factors in making the decision to research new technologies.

In February 2003, a small-scale pilot study of injecting base (alkaline) solution directly into the F Area groundwater was completed and successful in raising the pH value of the groundwater. The successful pilot study supported the basis for revising the Corrective Action Plan (CAP) that included new passive remediation technologies. The revised CAP was submitted to SCDHEC in March 2003.

In October 2003, SRS received conditional approval from SCDHEC to suspend WTU operations and prepare for the installation of the new passive system. As a result, SRS suspended operations at both WTUs concurrent with the plan and began with preparations to install the replacement passive remediation technologies. The replacement technologies consist of engineered tritium barriers and base solution injections into the groundwater that will address both creek/seepline and groundwater contamination.

Installation of the engineered tritium barriers must be completed by March 31, 2005.